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ABSTRACT

This investigation examined the effects of mediation and Intelligence Quotient (IQ) scores on conceptual learning for black college students. It was predicted that higher IQ scoring subjects would not outperform lower IQ scoring subjects under nonmediated learning conditions but would significantly outperform lower IQ scoring subjects under mediated learning conditions. Sixty subjects learned one of two paired-associate lists and a concept list. Mediation and nonmediation scores were derived for each subject based on performances of previously learned paired-associate word lists. At the conclusion of the concept list, the Vocabulary test of the Wechsler Adult Intelligence Test was administered, followed by a Family Background Questionnaire to ascertain the socioeconomic status of the participants. Separate Scheffe Multiple Comparisons were performed on the two concepts employed (white and soft). The findings indicate that when "soft" was the concept investigated, both the highest and lowest scoring groups profited from the mediation condition; but only the highest scoring group utilized the mediation condition to sufficiently and significantly improve performance over nonmediation. Analyses derived from "white" did not indicate a significant main effect of either IQ score or condition. In fact, there was reversal of the phenomena found for "soft." (PN)

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THE EFFECTS OF INTELLECTUAL FUNCTIONING AND MEDIATION ON CONCEPTUAL LEARNING FOR BLACK COLLEGE STUDENTS*

by

Felicia Thomas

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THE EFFECTS OF INTELLECTUAL FUNCTIONING AND MEDIATION ON CONCEPTUAL LEARNING FOR BLACK COLLEGE STUDENTS

The main purpose of this investigation was to determine if the interaction of mediation and IQ scores found for white college students and black and white first graders could be replicated with black college students. More specifically, it was predicted that higher IQ scoring subjects would not outperform lower IQ scoring subjects under nonmediated learning conditions but would significantly outperform lower IQ scoring subjects under mediated learning conditions.

In the present study as in previous studies with white college students, subjects learned one of two paired-associate lists (PAL) and a concept list. The first PAL was designed according to mediated generalization theory to facilitate the attainment of the concept "white" on the subsequent concept list. The second PAL was similarly designed but was constructed to facilitate the subsequent attainment of the concept "soft." The concept list contained three groups of four nouns each, with the four words in each group representing instances of the same concept. The subject's task was to discover the three adjectives ("white," "soft," and buffer concept "large") which could describe the three groups. Mediation and nonmediation scores were derived for each subject based upon his performance on the four words that were facilitated (mediated) or not facilitated (nonmediated) on the PAL which he had previously learned. At the conclusion of the concept list, the Vocabulary subtest of the Wechsler Adult Intelligence Scale was administered as the intellectual functioning measure. Subjects were divided into three IQ groups (high, medium, and low) based upon the distribution of their scores. Lastly, subjects completed a Family Background Questionnaire.

Results indicated that the two concepts employed ("white" and "soft") interacted differently with Condition ($p < .004$). When "soft" was the concept investigated, both the highest and lowest IQ scoring groups profited from the mediation condition; but only the highest scoring IQ group utilized the mediation condition to sufficiently and significantly improve performance over nonmediation ($p < .05$). The highest group did not, however, outperform the lowest scoring group on the nonmediated task. These findings are consistent with previous research on intellectual functioning and mediation for white college students and black and white first graders. This clearly suggests that the nature of intellectual functioning is the same for black and white college students as well as for black and white children. That is, black college students do not display different and inferior learning strategies, patterns, and styles than do their equivalent IQ scoring, white counterparts. Specifically, high IQ scoring black first graders and college students were demonstrated to effectively utilize symbolic information processing.

Analyses derived from the concept "white" indicated a reversal of the phenomena demonstrated for "soft": When highest and lowest IQ scoring subjects had prior exposure to a list designed to facilitate the learning of the concept "white" on the subsequent concept list, there was resistance to producing the response "white". This effect was not apparent for "white" when it had not been mediated on the prior paired-associate list. Interestingly, the middle IQ scoring subjects did not react differently toward the two concepts.

It was hypothesized that the prior experience of black students with the concept "white" during the learning of its mediated paired-associate list might have operated as a cue which produced anxiety and consequent "Perceptual Defense." It was concluded that the effects of intellectual functioning and mediation on conceptual learning are the same for black college students when appropriate stimuli are employed; that the utilization of certain concepts (e.g., "white" for black students) may be inappropriate for a given population due to the stimuli's anxiety arousing effects.

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CHAPTER I

INTRODUCTION

In previous studies of the relationship of IQ test scores to conceptual learning, researchers have found that performance is correlated with the interaction of numerous subject variables as well as the organization and structure of the learning tasks. Among demonstrated, critical factors are: 1) the kind of individual difference variable investigated (e.g., a score on an IQ test or creativity measure); 2) the particular measuring instrument used (e.g., the Wechsler Adult Intelligence Test); 3) the task employed (e.g., mediation or nonmediation paradigm; 5) the performance indicator employed (e.g., trials or errors); 6) the information provided by the task (e.g., amount of relevant or irrelevant information provided); and 7) the stage of the learning process investigated (e.g., time to the first correct response or time from the first correct response to concept attainment (Jacobson, Dickinson, Fleishman and Haraguchi, 1969; Jacobson, Elenewski and Lordahal, 1968; Jacobson, Elenewski, Lordahal and Liroff, 1968; Jacobson, Millham and Berger, 1969; Jensen, 1968; Osler and Fivel, 1961; Osler and Trautman, 1961; and Osler and Weiss, 1962).

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Conceptual Learning and Age

Results of the individual studies appear to be determined by the specific interactions of the experimental modifications in each of these factors. That is, all the factors just mentioned influence the results of any study. For example, Osler and Fivel (1961) investigated the relationship of intellectual functioning and age in concept attainment employing the inductive method: Subjects were presented with different stimuli, all of which belonged to a common category, and were expected to give the same response to each element of the group. Prior to this study, researchers had employed the interview-questionnaire method or the performance method (Vinacke, 1952).

Osler and Fivel (1961) felt that both of these methods presented problems since the former assumed that coexisting with a child's knowledge of a concept was his ability to translate this knowledge of a concept into words and the latter was essentially a sorting technique in which performance could be determined by factors other than knowledge of the specific concept under observation. For instance, the interest, experience and preference of the subject were important determining factors in concept learning where alternative responses existed for categorizing. With the employment of the inductive method, however, correct attainment of concepts is achieved solely when the subject responds to the new stimuli at a level of accuracy pre-

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scribed by the experimenter. Consequently, reducing or eliminating the power of competing stimuli.

Furthermore, the Osler and Fivel (1961) investigation contrasted normal and superior subjects while previous studies of conceptual learning compared normal and feeble-minded subjects. Since the subjects represented the extremes and midpoint of the elementary school population and were included within Piaget's three stages of mental development, the subjects were within three age groups, 6-, 10-, and 14- years. Three concepts (bird, animal and living thing) were used because they represented increasing levels of difficulty which would increase the discriminative power of the tasks (Welch and Long, 1940). Subjects were shown two wooden boxes with a picture attached to each, one depicting the desired concept and the other unrelated or neutral to the concept. Instructions for successful completion of the task were not explicitly given. Subjects were merely told that a marble was hidden under one of the boxes and if they looked at the picture they would choose the correct box every time and win the marble. The Wechsler Intelligence Scale for Children was administered as the IQ measure.

Results indicated that age and IQ scores were associated with more effective concept learning while no effect of concept difficulty was apparent. However, there was a nominal effect of concept hierarchy displayed for

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subjects who scored in the normal range.

Merely knowing that age and IQ scores were correlated with concept attainment was not sufficient to clarify the specific mechanism by which these two varibles enhanced performance. Osler and fivel (1961) wanted to ascertain if there was a qualitative difference in the learning strategies of older and higher scoring subjects or simply a greater increase in response tendency. Findings of Kendler and Kendler (1959) suggested that to examine this question one had only to observe the learning curves of subjects and one would discover a gradually inclining curve for lower scoring subjects and a curve which increased suddenly for higher scorers. A gradual attainment of a concept would be compatible with continuity theory of learning whereas sudden acquistion would be compatible with the theory of learning through hypothesis testing. In an attempt to explore this phenomenon, Osler and Fivel (1961) analyzed the responses just prior to concept attainment of their subjects. These curves, indeed, were demonstrated to exist for the lower and higher scoring groups but neither age nor concept hierarchy yielded any difference. Therefore, the correlation between concept attainment and IQ scores across ages appeared to be the result of hypothesis testing.

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Stimulus Complexity and
Conceptual Learning

Osler and Trautman (1961) further investigated the Kendler and Kendler (1959) hypothesis that high and low scorers on an IQ test utilized symbolic mediators in discrimination learning and reached concept attainment by building and testing successive hypotheses, whereas low scoring subjects were inclined to learn through and build up S-R associations. Consequently, if one were to observe the learning curves of high and low scoring subjects, it was hypothesized that one would discover a gradually inclining curve for low scoring subjects and a curve which increased suddenly for high scorers. Furthermore, it was contended that if the hypothesis of the varying learning mechanisms was valid and high scorers employed hypothesis testing in concept attainment, it should be possible to influence their performance by altering the number of relevant or irrelevant dimensions on which hypotheses could be founded; low scorers were hypothesized to be unaffected by the amount of relevant or irrelevant stimuli since they were believed to learn through S-R associations.

The investigation was of a single concept: The number two represented by two sets of materials; one set represented the single concept while the other set represented the same concept but was designed to suggest many more hypotheses than the first set by containing objects

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varied in shape, size, color and content. The positive stimuli of the first set, Formal Two (FT), consisted of two solid, black circles positioned in random, unduplicated, patterns on 5 X 5 cards. The negative stimuli of this set consisted of identical black circles in numbers ranging from one to five, excluding two, also positioned random patterns on the cards.

The positive stimuli for the second set contained two identical pictures of common objects on cards identical to those used in the FT set. The pictures varied in shape, size, color and content. This set of stimuli was called the Object Two (OT) set. The negative stimuli for this set consisted of the same kind of pictures but were in numbers other than two.

The rationale for the design of the stimuli was that the OT set would suggest many more hypotheses than the FT set due to the assorted shape, size, color and content of the various objects depicted. Consequently, the performance of higher scoring subjects would be affected since they were believed to utilize hypothesis testing strategies in concept attainment. Lower scoring subjects, however, would not be affected by varying the number of irrelevant dimensions on which hypotheses could be tested for they would tend to achieve solution of the problem through the gradual building up and learning of S-R associations. More specifically, it was hypothesized that results would show a

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significant interaction of IQ test scores and the number of irrelevant dimensions in the concept sets.

Subjects were elementary and junior high school children. Each subject worked individually on either the OT or FT set. Subjects were shown the positive and negative stimuli of a set together and asked to choose the correct one of the two. The criterion of success was ten consecutive correct responses.

Results indicated that subjects who scored high on the IQ measure showed more effective concept learning than lower scoring subjects on the FT task where information which was useful in symbolic information processing was provided. However, in the similar OT concept learning situation in which the amount of irrelevant information was increased, no significant difference between high and low scoring subjects' performance was found. Therefore, a significant interaction of test scores and mediation was found, supporting the hypothesis that high and low IQ scoring subjects utilize different learning strategies.

Effects of Instruction

In addition to studies on the amount of relevant information provided, effects of instructions, mediation, and IQ scores have been studied as well (Osler and Weiss, 1962). It had been hypothesized that the superior perfor-

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mance of higher scoring subjects might be the result of their supplementing the experimenter's instructions with their own instructions to themselves, instructions which induce them to search for consistencies and test hypotheses. More specifically, when instructions are vague, higher scorers would tend to perform better than lower scorers, but this advantage would not be as apparent as the instructions became more specific and there would be less need for problem finding. In essence, it was postulated that with non-specific instructions learning tasks presented to subjects have two components, namely, problem finding and problem solving; and that the superior performance of higher IQ test scorers might be attributable to greater proficiency at either or both of these components. On the other hand, when instructions are specific and the problem which the subject is to solve is defined, the problem finding component was believed to be reduced to a minimum or resolved, thus, diminishing the superiority of the higher IQ scorers.

Two experiments were performed, both replicating the methodology of the Osler and Fivel (1961) study. Experiment II was identical to Experiment I except for the specificity of the instructions rendered. Subjects in Experiment I were told that if they were to look at the pictures they would be able to get many marbles. On the other hand, subjects in Experiment II were told that if they looked at the pictures carefully they would see that there was some-

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thing in the pictures like an idea that would tell them which one to choose to get a marble every time. The criterion for success was 10 consecutive correct responses. At the completion of the task, subjects were asked how they knew the correct answer.

Results showed that with instructions which did not specify the nature of the task, age and IQ score were significantly correlated with concept attainment, with older, higher scoring subjects performing better. However, when the instructions as to the nature of the task were explicitly given, the effect of IQ test score was no longer apparent and only age was a significant predictor of performance. Similar results were obtained when the number of subjects who were able to verbalize the concepts were analyzed.

Osler and Weiss (1962) concluded that if their assumption that specific instructions reduced or eliminated the problem finding aspect of the learning tasks, it could be inferred that:

> . . . higher intelligence gave S an advantage in problem definition but not in problem solution in the concept attainment task.

Another valid possibility, however, is that problem finding abilities subsequently gave subjects the advantage when taking the IQ test. Thus, problem finding abilities may be a prequisite to scoring high on an IQ measure instead of the

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converse.

Furthermore, it was concluded that if the concept tasks had been made more difficult, the high IQ scorers might also have shown superior performance in the problem solving phase of the task. In addition, since age was found to be significant in concept attainment, maturation was postulated to entail growth in problem solving ability at least until some point between 10 and 14.

To determine the changes in problem finding ability as it relates to age, performance at each age level under the two instructional sets were compared. Results suggested that between 6 and 10 years subjects' performances were enhanced by explicitness of instructions. It appears that the superior performance attributed to age was not the result of improvement in problem finding but by more effective problem solving.

Mediation and Nonmediation

In the above studies, the relationships between intelligence, mediation and nonmediation were not directly controlled but inferred from observation of subjects' performances on a variety of tasks. Several assumptions concerning the relationship of intellectual functioning and the use of conceptual processes were made in these studies: 1) Individuals who score high on an IQ test learn concepts

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more readily than persons who score lower; 2) High scorers use mediation and other cognitive processes more effectively than lower scorers; and 3) Intellectual functioning operates differentially at various stages of the learning processes. However, these hypotheses had not been validated empirically (Jacobson, Dickinson, et al., 1969).

Jacobson, Dickinson, et al., (1969), however, administered the Cooperative School and College Abilities Test (SCAT) and employed a paradigm in which mediating processes could be directly controlled. The paradigm constructed by Mednick and Freeman (1960) in which the nonmediated paradigm was modified so as to simultaneously study both mediation and nonmediation was employed.

Subjects (white, undergraduate volunteers) learned one of two paired associate lists and a concept list. The paired associate lists were composed of 12 word pairs. On the first list (PAL-1) 4 of the 12 word pairs were designed so as to facilitate the subsequent learning of the concept "white" on the concept list. The other 8 word pairs were neutral with regard to "white." The second paired associate list (PAL-2) was similar to the first list but 4 of its 12 word pairs were designed to facilitate the later learning of the concept "soft." The concept list contained 12 nouns which could be placed into three groups of four words each, with the four words in each group representing a common concept. Subjects were required to

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learn the three adjectives ("white," "soft," and buffer concept "large"), each of which described a different group of the 4 nouns. For those subjects who learned PAL-1, the learning of "white" on the concept list was facilitated, and the concept "soft" was facilitated for those subjects who learned PAL-2. The concept "large" had not been facilitated on either of the paired associated list and was included as a buffer.

Mediation and nonmediation concept scores were obtained for each subject; with the mediation score being derived from the subject's responses to the 4 words which were related to the facilitated concept on the paired associate list learned. The nonmediation score was derived from performance on the 4 words related to the concept which was not facilitated on the paired associate list. Therefore, each subject was his own control.

Paired associate lists were learned to a criterion of two successive perfect trials, and the concept list was learned to a criterion of one perfect trial. The word pairs and concept list items were presented at 4-second intervals. Three arrangements of the lists were utilized and kept constant for all subjects so as to control for presentation effects. The SCAT was administered at the end of the session.

The results of the study suggested that 1)utilization of the mediation paradigm improved the performance of

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all subjects, supporting the assumption that mediated generalization facilitates learning of concepts; 2) subjects who scored high on the SCAT learned both mediated and nonmediated concepts more rapidly than lower scoring subjects. They did not find a significant interaction of test scores and mediation conditions, which suggested that when subjects learn the same materials in mediated and nonmediated concept learning, the magnitude of the increase in mediated concept learning is the same for higher and lower scoring subjects. That is, the facilitative effect of the mediated concept learning over the nonmediated concept learning is a constant, additive function rather than a multiplicative one. Hence, these findings did not support the hypothesis that higher IQ scorers' superior performance over lower scorer's performance could be accounted for by their superior use of cognitive processes, specifically symbolic information processing.

Jacobson, Millham, and Berger (1969) examined the question: Do individuals of varying intelligence use the same cognitive processes but with differential efficiency, or do they employ different processes in retrieving information in mediated conceptualization?

The methodology used was the same as in the aforementioned study. Again, undergraduate volunteers were used. Instead of the SCAT the Vocabulary test of the Wechsler Adult Intelligence Scale (WAIS), which is the

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best single predictor of Full Scale IQ test scores, was administered.

The results of the study demonstrated that 1)concepts were learned significantly more rapidly under the mediation condition, and 2)in contrast to the earlier study, IQ scores did interact with the mediation condition. Subjects who scored high learned mediated concepts more rapidly than subjects who scored low, but this effect was not found in the learning of nonmediated concepts; there was no significant difference between the performance on the nonmediated task of those subjects who scored higher and those who scored lower. It was concluded that lower scorers employed the same learning strategies for both tasks since their performance did not improve from the nonmediated to mediated tasks, while the higher scoring subjects solved the mediation problem more efficiently by the use of symbolic processes. Thus, the two measures of intellectual functioning (WAIS and SCAT) interacted differentially with the experimental conditions. That is, subjects scoring higher on an IQ measure do not always outperform lower scoring subjects. However, IQ scores and SCAT scores are correlated only about .6 and thus it is difficult to access the meaning of the Jacobson, Dickinson, et al. study. One possibility is that the SCAT is a good predictor of people who try harder on verbal learning tasks.

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Conceptual Learning Tasks and Methods of Presentation

The procedure most often used in conceptual learning studies has been the method of successive presentation, also called the response method. In this method subjects are presented with a series of stimuli and required to name each stimulus as it appears as an example of a particular concept. Using this method researchers have designated two stages into which conceptual learning may be divided. The first stage has been termed the response generation stage of conceptualization. This is the interval prior to the first correct response, where subjects must retrieve or process information in order to generate the first correct response. The problem is believed to be a generative one whereby subjects must use mediation maximally to produce the first correct response (Jacobson, Dickinson, Fleishman, and Haraguchi, 1969; Jacobson, Elenewski, Lordahl, and Liroff, 1968; Jacobson, Millham, and Berger, 1969).

The second stage has been differentiated as the period from the first correct response to concept attainment. During this recognition stage of conceptualization, as it has been termed, the subjects must relate or generalize the correct response to similar instances.

Jacobson, Dickinson, et al., (1969), in addition to exploring the learning strategies utilized by subjects

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in conceptual tasks, investigated the stage at which IQ scores and mediation interact. It was hypothesized that during the response generation stage high scorers would display their greater superiority.

An analysis of the number of trials to the first correct response (response generation stage) showed significant effects of IQ scores and mediation, while an analysis of the number of trials from the first correct response to the attainment of concepts (recognition stage) did not show a significant effect of IQ score and mediation. It was found that the interaction of IQ scores and mediation occurs almost exclusively in the response generation stage, indicating that mediation may be associated with information retrieval rather than recognition or response identification.

The response method has frequently been thought of as being identical with or a variant of rote learning (Colemen, 1964). Jacobson, Elenewski, and Lordahl (1968), in order to assess this hypothesis, compared the performances of subjects on mediated and nonmediated variants of the response method with simple performance on paired associate (rote) learning tasks. The methodology adopted was identical to those previously mentioned. Subjects were white, undergraduates who learned one of two paired associate lists and a concept list with the concepts "white" and "soft" being facilitated by having learned one

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or the other of the two PAL's. Four indices of paired associate learning were utilized: 1)trials to learn all pairs; 2)number of omission errors; 3)number of incorrect responses; and 4)total number of errors (item 4 = item 2 + item 3).

Six indices of concept learning were employed: 1)trials to the first correct response; 2)trials from the first correct response to concept attainment; 3)total trials to concept attainment (item 3 = item 1 + item 2); 4)number of omission errors; 5)number of incorrect responses; and 6)total number of errors (item 6 = item 4 + item 5).

Based upon the results it was concluded that no significant relation was indicated between paired associate learning and performance on mediated concept learning. The hypothesis that the nonmediated task is a form of rote learning was not supported. In addition, a small but significant relationship was found between the mediated and nonmediated lists.

The second most widely used alternative to the response method is the method of simultaneous presentation where all instances of a concept are presented together as a set. The subject is expected to identify simultaneously all the stimuli as examples of the correct concept. While the response method sometimes has been thought of as a variant of rote learning, the method of simultaneous pre-

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sentation has been considered as greatly contingent on symbolic processes (Bourne, 1966).

In an effort to determine if the low correlation demonstrated between mediated and nonmediated lists was confined to the method of successive presentation or was a general characteristic of concept learning on a variety of tasks, Millham, Jacobson, and Berger (1971) studied the relationship of IQ test scores and mediation by utilizing two variants of the method of simultaneous presentation: massed practice and distributed practice. In the massed practice variant, the stimuli of each set were presented consecutively for a total of 20 trials; in the distributed practice variant each set of stimuli were presented for a total of 20 trials but the sets were in mixed rather than consecutive order.

The paired associate and concept lists were the same as those used in the previous studies. Subjects were randomly assigned to either the massed or distributed practice conditions, both of which were constructed to differentially facilitate the use of symbolic processes. The massed practice task was designed to facilitate the employment of symbolic processing and minimize interference effects; while the distributed practice task was designed to interrupt continuous symbolic information processing and to promote interference effects. In addition, two measures of intellectual functioning were employed. The

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Vocabulary test of the WAIS and the Abstraction Scale of the Shipley-Hartford intelligence test. It was felt that vocabulary and abstraction are indicators of associative and inferential processing, respectively. Vocabulary tests are thought to measure the ability of the subject to respond to verbal stimuli with common (conventional) and equivalent (synonymous) associative responses. It is necessary that the responses be both common and equivalent associates since they have to meet norms found in the dictionary, which dictates those associative responses that are commonly regarded by the language community as stimulus equivalent.

Accordingly, scores on a vocabulary test have been postulated and demonstrated to be excellent predictors of the use of associative processes in concept learning employing the response method (Jacobson, Millham, and Berger, 1969; Jacobson, Elenewski, Lordahl, and Liroff, 1968).

In contrast, scores on the Shipley-Hartford Abstraction subtest has been viewed as indicative of inferential information processing ability. For example, the Abstraction test requires subjects to finish the following line:

"oh ho/ rat tar/mood . . . . ."

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Inferring the correct rule for the solution of this problem is necessary for completion. Differing from the Vocabulary subtest, it is not necessary for the subject to produce a stimulus equivalent to the components presented. Thus, inferential information processing is necessary for the solution to Abstraction test problems (Millham, Jacobson, and Berger, 1971). It was further hypothesized that associative and inferential processes could be conceptually and empirically separated.

Generally, results indicated that both masses practice and mediation facilitated learning. The joint presence of both conditions did not, though, produce an additive effect. More detailed analysis, however, indicated that high vocabulary scorers learned concepts quicker under massed practice in both the mediation and nonmediation conditions, while there were no significant differences found between the massed and distributed practice in either the mediation or nonmediation condition for lower scoring subjects. It was concluded that subjects who are high in associative and/or inferential processing abilities perform better than lower scoring subjects when the task is arranged so as to permit subjects to utilize information provided by the mediation condition if time is available for the continual, uninterrupted processing of this information.

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Intellectual Functioning, Symbolic Information Processing and Race

A major controversy in the field of intelligence testing is the issue of performance of black persons on IQ tests. Some researchers, such as Jensen (1969), have argued that the commonly observed difference in scores of blacks and whites does not reflect differential quality of education or other environmental variables but rather reflects a basic, physiological, genetic factor. He postulated that blacks display different and inferior learning strategies, patterns, and styles as compared to whites. In speaking of these differing modes of learning, Jensen hypothesized two distinctive types of learning abilities, associative and conceptual; designated as Level I and Level II, respectively. Level I abilities would involve learning whereby relatively little transformation of the input stimuli is required, so there is little or no difference between the forms of the stimuli and the forms of the responses. Rote learning, serial learning and paired associate learning were considered indices of Level I type learning tasks. Level II abilities, however, would require the subject to actively transform or manipulate the stimuli input through self-initiated elaboration before overtly responding. Concept learning and problem solving tasks were given as examples, with IQ scores being cited as good measuring devices.

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Representative of the methodology employed and results obtained in Jensen's investigations is a study (Jensen and Rowher, 1969) where 100 low SES black pre-school children in a private nursery between the ages of 3 and 5 were given serial learning tests, digit span tests and a paired associate test, with the paired associate test containing pictures of familiar objects. The Peabody Picture Vocabulary Test was administered as the IQ measure. Based upon the results of this and other studies (Jensen and Rohwer, 1963; and Jensen, 1968), the following characteristics of the levels were postulated.

	LEVEL I ABILITIES	LEVEL II ABILITIES
1.	Indicative of associative learning ability.	1. Indicative of conceptual and problem solving abilities.
2.	Necessary but not sufficient for Level II abilities.	2. Differentially distributed in the lower class and middle class, with lower classes having less of this ability.
3.	Evenly distributed in all social class groups (SES).	3. Certain neural structures must be present for this ability to develop; these structures have become differentially distributed in the population.
4.	Neural structures necessary for Level II abilities not present.	4. Most important for scholastic achievement.

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As a consequent of the hypothesized differing nature of intellectual functioning of blacks and whites, Jensen felt that the process of educating blacks should be different and directed toward the learning of more specific skills, since their strengths are not believed to be of a cognitive or "intellectual" type. The educational achievements of these children could be raised through instructional methods which would make the attainment of scholastic skills less dependent upon Level II and encompass Level I abilities more (Jensen, 1972).

A recent study by Friendly and Berger (1976) was designed to examine the question of black-white differences in the nature and quality of intellectual functioning. Their study provided a direct comparison of the effectiveness on intellectual functioning in black and white first grade children. In order to develop a viable construct for intellectual functioning, it was necessary to extend these findings across the developmental age span. Thus, another intention of the Friendly and Berger study was to extend the findings with college students regarding mediation and intellectual functioning to first graders. That is, they wanted to see if mediation and IQ scores operated in the same manner for first graders as reported above for college students.

The methodology used with college students was adapted in use with the first graders, providing a continu-

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ity with the previous studies. Since first graders cannot read, stimuli consisted of combinations of letters from the alphabet and pictures of common objects.

Paired associate lists were constructed using a letter of the alphabet paired with a picture of common object be effective in enhancing symbolic information processing on a variety of tasks.

(4) One of the main purposes of the Friendly and Berger (1976) was to determine if the interaction of mediation and IQ scores found for college students could be replicated using first graders as subjects. In that study, as in the studies with college students, a vocabulary measure of intellectual functioning was used. The significant interaction of mediation and IQ scores was in fact replicated with the first graders. Apparently, only the higher scoring subjects utilized the mediation condition to sufficiently improve their performance. On the initial paired associates task higher IQ and lower IQ scoring subjects did not demonstrate differential symbollic information processing. The results of this study clearly demonstrated that symbolic information processing operates similarly across ages in subjects who score higher on IQ tests, and that verbal mediation plays an important role in the performance of high IQ scoring subjects.

(5) The results just reported were obtained for both black and white first graders. That is, for both black and

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white children scoring higher on the IQ measure, paired associate learning was best under the mediation condition and better than for children scoring lower on the IQ measure. In addition, there was no difference in performance on the initial, non-mediated paired associate task between higher and lower scoring children within either the black or white samples (an outcome (e.g., letter A with a picture of a man). All subjects learned this non-mediated list of six pairs to a criterion of two successive, perfect trials. On a second paired associate task, half the subjects received a list on which performance was mediated from learning the first list (e.g., letter A with a picture of a woman). The other subjects received a non-mediated list for their second task (e.g., letter A with a picture of a block). The Peabody Picture Vocabulary Test was used to obtain IQ scores and to obtain equivalently scoring groups of black and white children.

Consistent with findings on college students, there was no significant difference in performance between higher and lower IQ scorers on the first, non-mediated task. Both black and white higher IQ scorers showed significant improvement from the non-mediated to the mediation task. These findings also paralleled those for college students. Finally, both black and white higher scorers performed better than lower scorers on the mediated list, again paralleling college students.

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It was found that performance was best under mediation conditions. This finding is consistent with the results of Jacobson, Dickinson, Fleishman, and Haraguchi, 1969; and Jacobson, Millham, and Berger, 1969. In the Friendly and Berger (1976) experiment, performance was facilitated on paired associate learning task whereas earlier studies used concept attainment tasks. Thus, mediation operates for both black and white higher scoring groups, which contrasts with Jensen's 1969 hypotheses. He believed that blacks were high in associative abilities. Following his reasoning, one would expect black subjects to perform significantly better than whites under the non-mediated paired associates task but to perform significantly less well under the mediation condition. Such results simply were not obtained. As with white subjects, high scoring black subjects utilized the mediation condition to sufficiently improve performance. Thus, the nature of intellectual functioning was demonstrated to be the same for both black and white children. While Jensen (1969) accused the proponents of the environmental basis of differences in IQ scores of blacks and whites of hypothesizing upon ad hoc data and making generalizations, he, too, made the same mistake of generalizing from inadequate and faulty data. The Friendly and Berger (1976) study clearly indicates that the nature of intellectual functioning is the same for both black and white children.

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Therefore, despite the claims of some, such as Jensen (1969) and Shockley (1971), different educational experiences are not required for some ethnic groups of children. That is, they do not have to be excluded from the mainstream of American education. If the nature and quality of intellectual functioning of both groups are the same, then it seems logical to conclude that black children are no less "educable" than white children and less genetically capable of abstract thinking and symbolic information processing. While it is possible that some black children may enter the classroom less prepared than white, middle-class and upper-class children due to environmental and other factors, this is not an indication of their ultimate intellectual capabilities nor a prerequiste to their being placed apart in special classrooms.

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CHAPTER II

RESEARCH DESIGN

The present study attempted to investigate the relationship of intellectual functioning, information processing, and mediation in conceptual learning among black, college students. Subjects learned one of two paired associate lists and a concept list. On the concept list were names of common objects and subjects were expected to learn adjectives to describe characteristics which they have in common (Underwood and Richardson, 1956). Certain items on the concept list were mediated by the subject having learned one or the other of the paired associate lists.

The methodology employed was the same as that commonly utilized in conceptual learning research. Namely, the subjects learned one of two paired associate lists and a concept list whose components were originally designed by Mednick and Freeman (1960). The first paired associate list (PAL-1) was designed to facilitate the attainment of the concept "white" when the subjects later learned the concept list. Four of the 12 word pairs on PAL-1 were designed to facilitate the learning of "white" in the subsequent concept attainment task. The remaining word pairs

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were neutral with regard to "white." The second paired associate list (PAL-2) was similarly designed but was constructed to facilitate the attainment of the concept "soft" in subsequent concept attainment. The concept list was composed of 12 nouns which were placed into three groups, each containing four nouns which were instances of a common concept. Four of the words (one group) were instances of the concept "white," four were instances of the concept "soft," and four were instances of the concept "large" which was not facilitated on either of the two paired associate lists but which was included as buffer concept. The subjects' task was to discover the three adjectives ("white," "soft," and buffer concept "large") which described the different groups of 4 nouns.

For those subjects who learned PAL-1, the learning of "white" on the concept list was facilitated; and for those subjects who learned PAL-2, the learning of "soft" was facilitated.

Mediation and non-mediation scores were derived for each subject. Mediation scores were derived from the subject's responses on the four words which were facilitated on the previous PAL list which he learned; and the non-mediation score was derived from the four words which were not facilitated on the earlier list. Therefore, each subject served as his own control.

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Bourne (1966) suggested that learning under the simultaneous presentation method where all instances of a concept are presented together as a set is greatly contingent upon symbolic information processing. In addition, Jacobson, Millham, and Berger (1971) demonstrated that the massed practice variant of the method was most facilitative for information processing. For these reasons, the present study employed the massed practice variant of the simultaneous presentation method, i.e., the subject was expected to identify simultaneously all the stimuli as examples of the correct concept, and the stimuli of each set were presented in consecutive rather than mixed order. In addition, to control for possible order effects, two orders of the concept list were employed. That is, either "white" or "soft" was the first concept presented to the subject on the concept list.

Black college students were employed as subjects since all the previous studies, with the exception of the Friendly and Berger study (1976), utilized white college students. Further, in light of findings by researchers such as Jensen (1969) and Shockley (1971), it was necessary to extend these findings to other racial groups. Employed in the Friendly and Berger (1976) study were black and white first graders, but it was necessary to extend these findings on intellectual functioning, mediation, and race to black college students to complete the racial and

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developmental age spectrims.

In addition, studies have demonstrated that race of the experimenter is an important variable which influences the performances of subjects on a variety of tasks, especially learning and intellectual type tasks. As a consequent, black experimenters were employed only. Both were females ages 22 and 25 years of age.

The vocabulary subtest of the Wechsler Adult Intelligence Scale was used in earlier works of conceptual learning and intellectual functioning because research indicates that it is the single best predictor of full scale IQ scores (it correlates with full scale IQ test scores between 0.7 and 0.9 across age levels), and of performance on mediation tasks. Finally, since this study was essentially an extension of the Jacobson, Millham, and Berger (1966) study to the intellectual functioning of blacks, it was most appropriate to use the vocabulary subtest here as well.

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CHAPTER III

HYPOTHESES

Information processing strategies of subjects differing in scores on IQ measures demonstrated that subjects who scored lower did not perform significantly different on mediated and non-mediated tasks, which seemed to suggest that they utilized the same information processing in learning both concepts; while those subjects who scored higher performed significantly better on the mediated concept list, suggesting that symbolic information processing might have been used by these individuals. In addition, it has been demonstrated that vocabulary test scores are excellent predictors of mediated, but not non-mediated performances (Jacobson, Millham and Berger, 1969; Jacobson, Elenewski, Lordahl, and Liroff, 1968; Friendly and Berger, 1976).

It was expected, therefore, that both higher and lower scoring subjects would use similar information processing strategies in non-mediated paired associate learning. That is, there would be no significant difference in performance between the higher scoring group and the lower scoring group on the non-mediated items of the concept list.

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Hypothesis 1: There would not be a significant difference in the mean number of trials required for the highest scoring group and the lowest scoring group to give the correct response to the non-mediated items of the concept list.

In mediated concept learning, however, higher scoring subjects were expected to utilize symbolic information processing to enchance their performance, while lower scoring subjects were expected to employ the same learning strategies as those used in non-mediated learning (Jacobson, Millham and Berger, 1969). Therefore, higher scorers were expected to perform better than lower scoring subjects under the non-mediation condition; and only the higher scoring subjects would demonstrate a significant mediation effect.

Hypothesis 2: There would be a significant difference in the mean number of trials required for the highest scoring group to give the correct response to the mediated items of the concept list.

Hypothesis 3: The mean number of trials required for the highest scoring group to give the correct response to the mediated items would be significantly less than the mean number trials required to give the correct response for the non-mediated items.

Hypothesis 4: There would be no significant difference in the mean number of trials required for the lowest scoring group to give the correct response to the mediated and non-mediated items.

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CHAPTER IV

METHOD

Subjects

Subjects were 46 black females and 14 black males enrolled at the University of Southern California, California State University at Los Angeles, and Los Angeles City College, with the majority of the subjects attending the University of Southern California. Subjects' ages ranged from 17 to 24 years, with 19 being the average age.

The average educational levels for the mothers of the high, medium, and low IQ scoring groups were 15.3, 13.7, and 12.8, respectively; and for their fathers, 13.9, 13.6, and 12.4, respectively. The average number of children in the family were 3.5, 3.2, and 4.7 and the reported average incomes were $27,000, $23,000 and $11,000, with more of the incomes of the lowest group being contributed to by only one parent. That is, many more of the lowest scoring group's families than the highest and middle scoring groups' families were either single parent families or one of the two parents was unemployed. Too, more of the highest scoring group's parents were professionally employed, with the most frequently occurring occupation being

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that of teaching; while the lowest scoring group contained skilled and unskilled positions with unemployment being common. The middle scoring group was a combination of the other two groups.

The average Grade-Point-Averages for the high, medium, and low groups were 2.9, 3.0 and 2.9 respectively. Basically, there were no differences in the college majors of the three groups, with pre-professional majors occurring most frequently, i.e., pre-law, pre-dentistry, pre-medical, and pre-pharmacy, etc. However, among the people not majoring in the aforementioned areas, more of the lowest scoring subjects were involved in nursing, social work, and psychology; while the highest scoring subjects were involved in business administration and journalism.

Equipment

A slide projector with an automatic timer was used for displaying the slides.

Learning Tasks and IQ Measures

All subjects learned one of two paired associate lists and one of the two orders of a concept list. Both paired associate lists consisted of 12 word pairs. On the first paired associate list (PAL-1), the learning of 4 of the 12 word pairs, SUGAR-BLACK, HAILSTONE-SHEEP, BUTTON-

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BREAD, and CABBAGE-SALT, was designed to facilitate the attainment of the concept "white" in subsequent concept learning. The remaining 8 word pairs on this list were neutral in regard to "white." The list is provided in Table 1.

The second paired associate list (PAL-2) contained 4 word pairs, PUP-HARD, GRAPE-LOUD, PEACH-SMOOTH, and CRADLE-COMFORT, which were designed to facilitate the attainment of the concept "soft" on the subsequent concept list. The list is provided in Table 2.

The concept list contained 12 words which were to be placed into 3 groups of 4 words each. The elements in each group were instances of the same concept. The subject was required to learn the three adjectives, each describing one of the three groups. The nouns SUGAR, HAILSTONE, BUTTON, and CABBAGE were instances of the concept "white"; PUP, GRAPE, PEACH, and CRADLE were instances of the concept "soft"; and ANCHOR, CAMEL, FOREST, and BARREL were instances of the concept "large." The latter concept was not facilitated on either of the paired associate lists and was included as a buffer concept. In addition, two orders of the concept list were employed. Half of the subjects were presented with "white" as the first concept to be learned and "soft" as the second; while half the subjects were presented with "soft" as the

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TABLE 1

PAIRED ASSOCIATE LIST I

Pair	Relevant Assoc.
sugar-black	black-white (.751)[a]
hailstone-sheep	sheep-white (.009)
button-bread	bread-white (.015)
cabbage-salt	salt-white (.006)
pup-afraid	none
grape-swift	none
peach-beautiful	none
cradle-anger	none
anchor-king	none
camel-dream	none
forest-command	none
barrel-lion	none

[a]Probability of occurrence of response term (e.g., "white") to stimulus term (e.g., "black").

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TABLE 2

PAIRED ASSOCIATE LIST 2

Pair	Relevant Assoc.	
sugar-afraid	none	
hailstone-anger	none	
button-beautiful	none	
cabbage-swift	none	
pup-hard	hard-soft	(.674)[a]
grape-loud	loud-soft	(.541)
peach-smooth	smooth-soft	(.206)
cradle-comfort	comfort-soft	(.069)
anchor-king	none	
camel-dream	none	
forest-command	none	
barrel-lion	none	

[a]Probability of occurrence of response term (e.g., "white") to stimulus term (e.g., "black").

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first concept to be learned and "white" as the second. The buffer concept "large" was the last concept to be learned for all subjects. The two orders of the concept list are provided in Table 3 and Table 4.

The process by which the mediation paradigm was hypothesized to facilitate the use of mediated generalization by subjects has been explained succinctly by several researchers (Jacobson, Dickinson, et al., 1969; Mednick and Freeman, 1960; and Russel and Jenkins, 1954) using the learning of the concept "white" as an example. In PAL-1 was the word pair SUGAR-BLACK. Mediation theory proposes that the stimulus word BLACK would evoke the implicit response "white," since "white" is a common response to BLACK. This has been schematized by Jacobson, Dickinson, et al., in the following way:

stimulus presented: sugar-black

implicit response of Subject: white

The implicit response "white" to the explicit word BLACK causes the word "white" to be present itself in contiguity with the word SUGAR in the mind of the subject, strengthening the association "sugar-white." When the subject later learns the concept list, the concept "white" is assumed to be attained more readily than if he had not been previously presented with the SUGAR-BLACK work pair,

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TABLE 3

CONCEPT FORMATION LIST - ORDER I

Instance	Concept
sugar	
hailstone	
button	"white"
cabbage	
pup	
grape	
peach	"soft"
cradle	
anchor	
camel	
forest	"large"
barrel	

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TABLE 4

CONCEPT FORMATION LIST - ORDER 2

Instance	Concept
pup	
grape	
peach	"soft"
cradle	
sugar	
hailstone	
button	"white"
cabbage	
anchor	
camel	
forest	"large"
barrel	

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That is, mediated generalization intensifies the sugar-white association and thus raises the response dominance of "white" to the word "sugar."

At the completion of the concept task, all subjects were administered the Vocabulary subtest of the Wechsler Adult Intelligence Scale as the IQ test measure since this test has been found to be the best single predictor of Full Scale IQ test scores. In addition, it was thought that the vocabulary test would measure the ability of the subject to respond to verbal stimuli with what is generally considered common (conventional) and equivalent (synonymous) associative responses, since responses have to meet specified norms found in the dictionary for maximum scoring (Jacobson, Millham and Berger, 1971). It was predicted that the more similar subjects' knowledge of these conventional definitions the more similarities there would be in their conceptual learning strategies.

Subjects' vocabulary scores were ranked from highest to lowest and the 20 subjects with the highest scores were assigned to the high group, the 20 middle scorers to the medium group, and the 20 lowest scorers to the low group. The distribution of verbal IQ scores ranged from 79 to 138, with the high scorers averaging 120, the middle scorers 103 and the low scorers 97.

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Family Background Information

At the conclusion of this study subjects were asked to fill out a Family Background Questionnaire. Questions included their grade level in college, major, Grade-Point-Average, the number of children in family, mother and father's last grade completed, mother and father's occupations and the family income. This questionnaire is provided in the Appendix.

Procedure

Each subject was presented with the following written paired associate list instructions and was told to read them silently as the experimenter read them aloud.

1. I will present some words paired with some other words on the screen one at a time. I want you to look at the pair--look at the first word and look at the second word--and remember that words went together as a pair. Because after all pairs have been presented once, I will show you just the first word and would like you to tell me what second word went with it.
2. Each first word will be presented for 6 seconds and you must give a response within the 6 second period. This will be followed with the correct pairing (again for 6 seconds) before the next

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first word is shown.

3. We will go through the list and get all word pairs completely correct twice in a row.

Subjects were then presented with Pal-1 or Pal-2 and required to learn the list to a criterion of two successive perfect trials. The stimuli were presented at 6 second intervals on a screen by a slide projector with an automatic timer.

After reaching the paired associate criterion of two successive perfect trials, subjects were presented with the written instructions for the concept list. Again, they were instructed to read silently as the experimenter read aloud:

1. There will be 3 groups of 4 nouns presented to you on the screen; the nouns in each group can be described by the same word, the second group of nouns can be described by a different word, and the last group by yet a different word. Your task will be to discover the three words which describe each of the three groups.
2. Each group will be presented for 6 seconds and you must give a response within the 6 second period. I will tell you "right" or "wrong" after each response.

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3. We will do this for each list several times and you are to give a response each time the list appears even though you know the response is wrong.
4. When you get the word correct that describes the 4 words in the list, we will go on to the second group, and when you get that list correct, we will do the third group.

Subjects were required to learn the concept list to one perfect trial or terminated after 20 trials. The procedure for display was the same as for the paired associate list. At the completion of the concept list, each subject was administered the Vocabulary subtest of the Wechsler Adult Intelligence Scale, after which they were asked to complete the Family Background Questionnaire.

Independent Variables

The two independent variables employed in this study were IQ test score and Condition.

IQ Score was a three level factor: high, medium, and low, derived from the range distribution in which the subjects' scores were located.

Condition was a two level factor: mediation and non-mediation, derived from the subjects' responses to the items comprising the facilitated and the non-facilitated concepts on the list he learned, respectively.

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Dependent Variables

The one dependent variable was Total Trials to Criterion with two levels:

1. Total number of trials required for subjects to obtain two successive perfect trials on the paired associate lists.
2. Total trials required for subjects to obtain the concepts.

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CHAPTER V

RESULTS

The data were initially analyzed with a Repeated Measures Multivariate Analysis of Variance Computer Program (Clyde, 1969) with Total Trials to Criterion as the Dependent Variable. An Analysis of Variance was computed for the Independent Variables of IQ Scores (high, Medium, low), Conditions (mediation, nonmediation), and Concept (white or soft).

Table 5 presents the means of the number of trials required for the higher and lower scoring groups to attain the concepts in the mediation and nonmediation conditions for both the concepts "white" and "soft." Since the concept "large" was included solely as a buffer concept, it was omitted from the analyses. Observation of Table 5 indicates that there was a significant interaction of condition with Concept for Trials to Criterion, $F(1, 12) = 12.659$, $p < .004$. These means are averaged across IQ scores in Table 6 and across condition in Table 7.

Thus, performance under mediation and nonmediation conditions was dependent upon the Concept under investigation for all subjects regardless of IQ group membership:

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TABLE 5

MEANS OF THE NUMBER OF TRIALS FOR ALL IQ GROUPS TO LEARN BOTH CONCEPTS IN THE MEDIATION AND NONMEDIATION CONDITIONS

VOCABULARY IQ MEASURE	CONDITION	CONCEPT			
		WHITE		SOFT	
		Mediation	Non-Mediation	Mediation	Non-Mediation
	High	15.9	12.8	12.2	16.9
	Medium	9.6	14.0	12.7	14.2
	Low	15.0	10.2	12.8	15.9

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TABLE 6

MEANS OF THE NUMBER OF TRIALS TO LEARN BOTH CONCEPTS IN THE MEDIATION AND NONMEDIATION CONDITIONS AVERAGED ACROSS IQ GROUPS

Condition	CONCEPT	
	WHITE	SOFT
Mediation	15.4	12.8
Nonmediation	11.6	16.4

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TABLE 7

MEANS OF THE NUMBER TRIALS TO LEARN BOTH CONCEPTS FOR ALL IQ GROUPS AVERAGED ACROSS CONDITIONS

	CONCEPT	
	White	Soft
High	15.9	12.2
Low	15.0	12.8

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Subjects reacted differently to the concepts "white" and "soft." Table 5 also indicates that there was a significant triple interaction among Condition, IQ Scores and Concept, $F(1, 24) = 3.818$, $p < .06$. Consequently, separate analyses of the two concepts "white" and "soft" were performed for the high and low IQ groups which were of interest in this study. Results for the middle group, however, will be reported when they are contrary to the others.

Analysis of "Soft"

Table 8 presents the mean number of trials required for subjects to attain the concept "soft" under the mediation and nonmediation conditions. It demonstrates that there was a significant main effect for condition, $F(1, 12) = 12.033$, $p < .005$. That is, subjects required significantly fewer trials to give the correct response to the mediated items of the concept list. There was not a significant effect of IQ scores, $F(1. 12) = 699$, $p < .419$; nor was there a significant interaction of IQ and condition, $F(1, 12) = 2.242$, $p < .147$. Table 9 presents these means.

Myers (1975) and McNemar (1969) suggest that the Scheffe Method of investigating selected contrasts is appropriate when the overall tests of F demonstrates

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TABLE 8

MEANS OF THE NUMBER OF TRIALS TO LEARN CONCEPT "SOFT" IN THE MEDIATION AND NONMEDIATION CONDITIONS FOR IQ GROUPS

	CONCEPT	Soft
CONDITION	Mediation	12.5
	Non-mediation	16.4

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TABLE 9

MEANS OF THE NUMBER OF TRIALS TO LEARN CONCEPT "SOFT" IN THE MEDIATION AND NONMEDIATION CONDITIONS FOR ALL IQ GROUPS

		SOFT	
	CONDITION	Mediation	Nonmediation
VOCABULARY	High	12.2	16.9
	Low	12.8	15.9

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significant mean differences and the data suggest specific comparisons. This post hoc method tests specific contrasts among the means by computing an overall confidence interval, K, while keeping the alpha level constant and testing the mean differences against this Critical Value, K. Consequently, differences are only regarded as significant at this prescribed alpha level if they are equal to or greater than the calculated Critical Value (McNemar, 1969).

Since the data of the present study suggested such multiple comparisons, Scheffe analyses were performed. Calculations indicated that 4.32 was the Critical Value which the mean differences would have to equal or surpass when the difference was in the predicted direction in order to be significant, $F(1, 60) = 4.00$, $p < .05$; while 6 was calculated to be the Critical Value which the mean difference would have to equal or surpass to be significant when this difference was in the opposite direction of that predicted. Since the alpha level remains constant, results will be reported as Significant or Not Significant depending upon whether the Critical Value is equalled or surpassed.

These analyses indicate:

1. There was not a significant difference in the mean number of trials required for the highest

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and lowest scoring IQ groups to give the correct response, "soft," when "soft" was the mediated concept.

2. Nor was there a significant difference in the mean number of trials required for the highest and lowest scoring subjects to give the correct response, "soft," under the nonmediation condition.
3. When "soft" was the concept either mediated or nonmediated, the highest scoring group's mean number of trials required to give the correct response to the mediated items was significantly less than the mean number of trials they required to give the correct response to the nonmediated items of the list. Thus, for the highest scoring group mediation appeared to exist.
4. While there was a tendency for the lowest scoring group to benefit from the mediation condition, the difference between the mean number of trials required to attain the mediated concept and the mean number of trials required to attain the nonmediated concept did not meet the specified criterion for opposite direction significance.

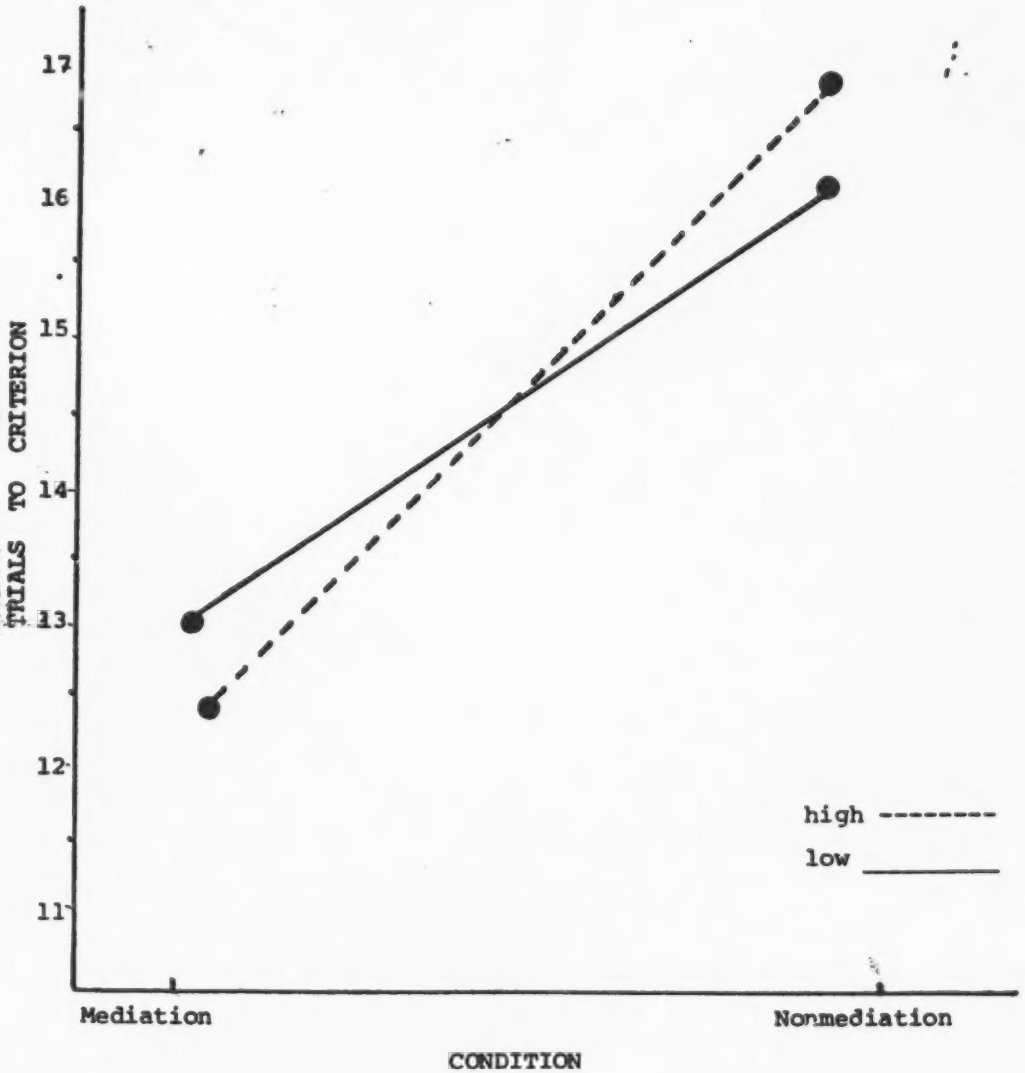
These phenonmena are represented graphically in Figure 1.

FIGURE 1

GRAPHIC PRESENTATION OF THE INTERACTION OF

IQ SCORE AND CONDITION FOR THE

CONCEPT "SOFT"



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Analysis of "White"

Table 10 presents the number of trials required for subjects to attain the concept "white" under mediation and nonmediation. Analyses of these means indicate:

1. There was not a significant difference in the mean number of trials required for the highest and lowest scoring groups to give the correct response to the mediated items of the concept list.
2. Nor was there a significant difference in the mean number of trials required for the highest and lowest scoring groups to give the correct response to the nonmediated items of the concept list.
3. Interestingly, for the highest scoring group the mean number of trials required to give the correct response to the mediated items of the list was greater than the mean number of trials required to give the correct response to the nonmediated items. Due to the difference in the direction of this finding and the predicted direction, this difference does not meet the Critical Value required for significance. That is, when the paired associate list was constructed so as to facilitate the attainment of the concept "white" it took these highest scoring subjects longer to attain this concept on the subsequent concept list.

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TABLE 10

MEANS OF THE NUMBER OF TRIALS TO LEARN CONCEPT "WHITE" IN THE MEDIATION AND NONMEDIATION CONDITIONS FOR ALL IQ GROUPS

		WHITE	
	CONDITION	MEDIATION	NONMEDIATION
VOCABULARY	High	15.9	12.8
	Medium	9.7	14.0
	Low	15.0	10.2

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4. Similar to the performance of the highest scoring group under mediation, the lowest scoring group also required a greater number of trials to attain the mediated concept than the nonmediated concept. This difference, however, does not meet the criterion for significance because of its direction. These phenomena are represented in Figure 2.
5. Interestingly, the medium scorers required significantly less trials to attain the mediated concepts than either the highest or lowest groups.
6. The medium group did not, however, require significantly less trials to attain the nonmediated concepts than the highest and lowest scoring groups.
7. Consequently, unlike the highest and lowest scoring groups, the medium scorers required significantly less trials to attain the concept under the mediation than under the nonmediation conditions.

Comparisons of "White" and "Soft"

As indicated earlier, an Analysis of Variance demonstrated a triple interaction of IQ score, Condition, and Concept, $F(1, 24) = 3.818$, $p < .06$. Utilizing Scheffe, Table 5 indicates:

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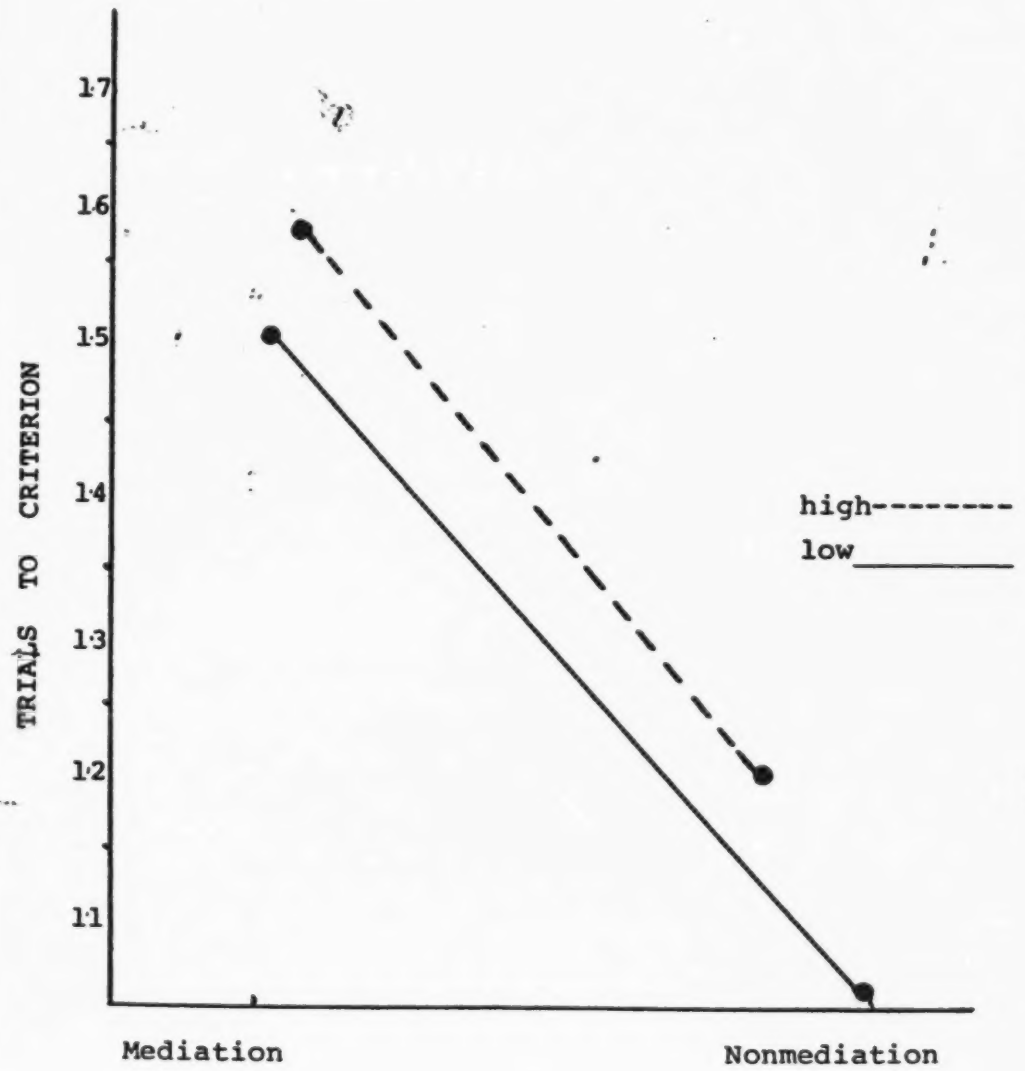
FIGURE 2

GRAPHIC PRESENTATION OF THE INTERACTION OF IQ SCORE AND CONDITION FOR THE CONCEPT "WHITE"



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1. The mean number of trials required for the highest scoring group to reach concept attainment under mediation when "white" was the concept was greater than the mean number of trials required for their highest scoring counterparts who received "soft" as the mediated concept. This difference, however, did not reach the Critical Value level.
2. While approaching significance there was not a significant difference between the mean number of trials required for the highest scoring group to reach concept attainment when "white" was the non-mediated concept and the mean number of trials required to reach attainment when "soft" was the non-mediated concept.
3. The mean number of trials required for the lowest scoring group to reach concept attainment under mediation when "white" was the concept investigated was greater than the mean number of trials required for the lowest scorers who received "soft" as the mediated concept, but this difference was not significant.
4. The mean number of trials required for the lowest scoring group to reach concept attainment when "white" was the nonmediated concept was greater than the mean number of trials required for the lowest scoring group to reach concept attainment

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when "soft" was its mediated concept. This difference did not meet the Critical Value for significance.

5. The mean number of trials required for the medium group to reach concept attainment under the mediated condition when "white" was the investigated concept was not significantly different from the mean number of trials required to reach concept attainment when "soft" was involved.

Figure 3 graphically represents these phenomena.

Analysis of Paired Associate List Performance

Initially, it was believed that an interaction of which concept was mediated and which concept was presented first in the concept list might exist; and that the most conducive situation for mediation to occur would be the one where the mediated concept, either "white" or "soft," was also the first concept presented in the concept list, e.g., "white" mediated and "white" presented first; or "soft" mediated and "soft" presented first. This interaction, however, was not found to be significant.

An analysis of the number of trials required for the subjects to reach the criterion of two successive perfect trials on the paired associate list did not indi-

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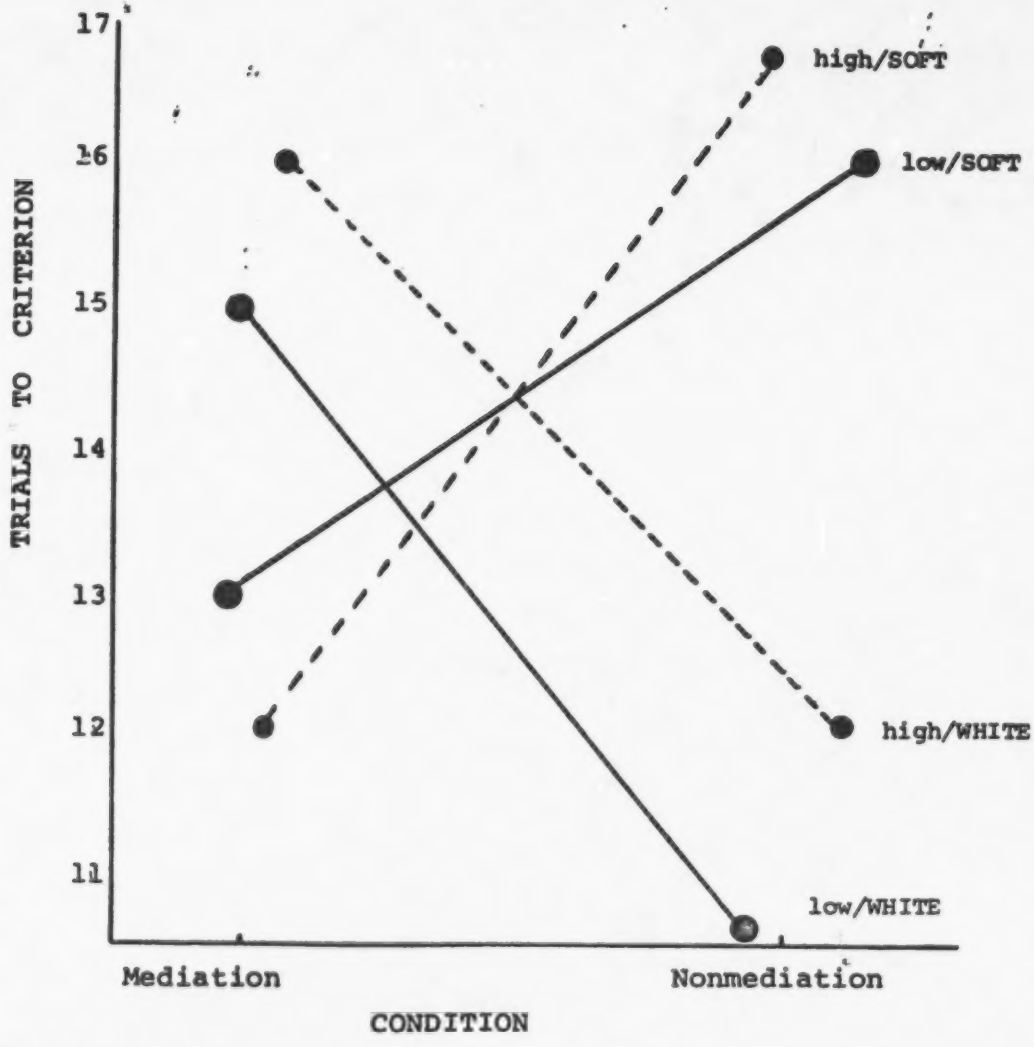
FIGURE 3

GRAPHIC PRESENTATION OF THE THREE-WAY INTERACTION

OF IQ SCORE, CONDITION AND CONCEPT



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cate a significant difference in the performance of the high and low scoring groups, $F(1, 38) = .067$, $p > .797$. These means are presented in Table 11.

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TABLE 11

MEANS OF THE NUMBER OF TRIALS REQUIRED TO LEARN PAIRED ASSOCIATE LISTS FOR ALL IQ GROUPS

High	Medium	Low
4.20	4.15	4.35

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CHAPTER VI

DISCUSSION

One of the main purposes of this investigation was to examine the effects of mediation and IQ scores on conceptual learning for black college students. We attempted to determine if the interaction of mediation and IQ scores found for white college students (Jacobson, Millham, and Berger, 1976) and black and white first grade children (Friendly and Berger, 1976) could be replicated with black college students. More specifically, it was predicted that higher IQ scoring subjects would not outperform lower IQ scoring subjects under nonmediationed learning conditions but would significantly outperform lower IQ scoring subjects under mediated learning conditions.

In the present study, as in the studies with white college students, subjects learned one of two paired associate lists and a concept list whose original components were designed by Mednick and Freeman (1960). The first paired associate list was designed according to mediated generalization theory to facilitate the attainment of the concept "white" on the subsequent concept list. The second paired associate list was similarly designed but was constructed to facilitate the subsequent attainment

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of the concept "soft." The concept list contained three groups of four nouns each, with the four words in each group representing instances of the same concept. The subject's task was to discover the three adjectives which could describe the three groups. Mediation and non-mediation scores were derived for each subject based upon his performance on the four words that were facilitated (mediated) or not facilitated (nonmediated) on the paired associate list which he had previously learned. At the conclusion of the concept list the Vocabularly test of the Wechsler Adult Intelligence Test was administered as the intellectual functioning measure, followed by a Family Background Questionnaire to ascertain the socioeconomic status of the participants.

Results indicated that the two concepts employed ("white" and "soft") interacted differently with the Independent Variable, Condition ($p < .004$). Therefore, it was decided to perform separate Scheffe Multiple Comparisons on the two concepts in question. Analyses derived from the concept "soft" indicated that there was not a significant IQ score effect but there was a significant condition effect ($p < .005$). The condition effect, however, was limited to the mediation condition for the highest IQ scoring group. Only the highest scoring subjects performed significantly better under mediation than non-mediation, but they did not significantly outperform lower

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scoring subjects on the nonmediated task. Analyses derived from "white" did not indicate a significant main effect of either IQ score or condition. In fact, there was reversal of the phenomena found for "soft." That is, with the concept "white" both the highest and lowest scoring subjects performed much better under the non-mediation condition and less well under mediation.

Evaluation of Hypotheses

Hypothesis 1. There would not be a significant difference in the mean number of trials required for the highest scoring group and the lowest scoring group to give the correct response to the nonmediated items of the concept list.

Subjects who scored highest on the vocabulary test did not significantly outperform the lowest scoring subjects on the nonmediated items for either concepts "soft" and "white." Both groups, though, required less trials to obtain the nonmediated concept "white" than their counterparts who received "soft" as the nonmediated concept. In other words, when "white" was nonmediated it was easier to learn than "soft" when it was nonmediated for highest and lowest scoring subjects; while middle scorers learned both concepts equally under nonmediation.

Thus, for nonmediation, the hypothesis was con-

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firmed and is consistent with results of Millham, Jacobson and Berger (1971), Jacobson, Millham and Berger (1969), and Friendly and Berger, 1976).

Hypothesis 2. There would be a significant difference in the mean number of trials required for the highest scoring group to give the correct response to the mediated items of the concept list.

Subjects who scored highest on the vocabulary test did not perform significantly better than the lowest scoring subjects under the mediation condition for either concepts "soft" and "white." Thus, for this population of highest and lowest IQ scoring, black, college students, the hypothesis that highest scorers would do significantly better than lowest scorers under mediation was not confirmed. This finding is also inconsistent with the findings of Jacobson, Millham and Berger (1969) but is consistent with the findings of Millham, Jacobson and Berger (1971). These studies will be discussed in greater detail at a later point in this paper.

In addition, the highest and lowest scoring groups took much longer to attain the concept under mediation when "white" was the mediated concept than they took to attain the concept "soft" when it was mediated. This finding is in direct opposition to the finding for nonmediation in the present study. That is, "white" is acquired

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quicker when it is nonmediated and "soft" is acquired quicker when it is mediated. This suggests that for these highest and lowest IQ scoring, black, college students, the concept "white" is attained if there is not prior experience with it during the learning of the paired associate list. Under this condition ("white" nonmediated) attainment was maximized for this subject population. But performance was actually inhibited by exposure to a list which was designed to facilitate the attainment of "white" in the subsequent concept list. Middle scorers did not seem affected by this phenomenon.

Hypothesis 3. The mean number of trials required for the highest scoring group to give the correct response to the mediated items would be significantly less than the mean number of trials required to give the correct response to the nonmediated items of the concept list.

Highest IQ scoring subjects did, indeed, perform significantly better under mediation than under nonmediation when "soft" was the investigated concept ($p < .05$). Prior experience with a paired associate list designed to facilitate the attainment of "soft" on the subsequent concept list was effective in enhancing the performance of the highest IQ scoring groups. There was a difference in their performance under mediation and nonmediation when "white" was the involved concept, but this difference was in the

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opposite direction of that predicted. That is, they performed better under nonmediation than under mediation.

This finding that highest IQ scoring, black, college students utilize mediation conditions to enhance their performance confirms the hypothesis and is consistent with previous findings of white, college students, and black and white first grade children. This result completes the developmental age span and suggests that mediation operates similarly for highest IQ scoring college students and first graders both black and white. This is clearly inconsistent with Jensen's (1969) proposals.

Hypothesis 4. There would be no significant difference in the mean number of trials required for the lowest scoring group to give the correct response to the mediated and nonmediated items of the concept list.

Similar to the highest IQ scoring group of the present study, the lowest IQ scoring group did display a tendency to improve their performance and benefit from mediation conditions when "soft" was the mediated concept, which is consistent with the findings of Millham, Jacobson and Berger (1971) where mediation enhanced performance regardless of IQ membership. Unlike the Millham, Jacobson and Berger (1971) study, this difference was not significant. Therefore, while performance improved under mediation it was not significantly different from their performance under nonmediation. This finding supports

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the hypothesis.

Mediation and IQ Scores

The finding of a difference, but not a significant difference, between the performance of highest and lowest IQ scoring subjects under mediation does not confirm the hypothesis about mediation effects and how they operate. Nor is this finding consistent with the findings of Jacobson, Millham and Berger (1969) and Friendly and Berger (1976) where significant mean differences between the groups were demonstrated under mediation conditions. The lack of a significant difference could be attributed to the tendency of the lowest IQ scoring group to also profit from the mediation condition. While the improvement of this group under mediation was significant, it was sufficient to decrease the mean difference between its mediated mean score and the mediated mean score of the highest scoring group such that no significant difference between the two means were found.

Comparison of the primary studies in this area demonstrates:

1. The Jacobson, Dickinson, et al., (1969) study indicated significant main effects for IQ and Mediation but no significant interaction.

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2. The Jacobson, Millham and Berger (1969) investigation indicated no significant main effects for IQ score or Mediation but a significant interaction.
3. The Millham, Jacobson and Berger (1971) study demonstrated a significant main effect for Mediation but no significant effect IQ or an interaction of IQ score and Mediation.

The results of Millham, Jacobson and Berger (1971) seem most comparable to the present findings. They found improvement in the performance of the lower scoring population under mediation. It was suggested that the difference in their results and the results of Jacobson (1969) was due to the difference in the presentation methods employed in the two studies. The former utilized the massed practice variant of the simultaneous method and the latter the successive presentation method. The present study employed the massed practice variant of the simultaneous method. Consequently, it is not surprising that as in the Millham (1971) study, the lowest scoring subjects also benefited from mediation. This suggests that concepts are learned most efficiently.

> . . . when the task is arranged so as to provide simultaneously both the information given by the mediation condition and time for the continual uninterrupted processing of the information provided . . . (Millham, Jacobson and Berger, 1971)

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Mediation and Black Students

While only the highest IQ scoring group utilized mediation to significantly improve performance, there was a tendency for the lower scoring IQ groups to profit from mediation as well. It is possible that the massed practice variant of the simultaneous presentation method may have operated to enhance the performance of the lower IQ scoring black students as well as the performance of the highest IQ scoring students. Interestingly, when "soft" was the investigated concept, the mediation and nonmediation scores of the lower IQ scoring black group were less than the mediation and nonmediation scores of their lower IQ scoring white counterparts in the Millham (1971) study.

Review of the personal data collected on the lowest IQ scoring students may lend clarity to their comparatively superior performance. It indicates that IQ group classification was consistent with socioeconomic status variables (SES), i.e., parents' education and occupations, family income and number of children in family. Grade-Point-Averages, however, appeared independent of IQ group membership. That is, there was no difference in the school performance of the three groups. While subjects from lower SES families knew less words than subjects from higher SES families, they were able equally to compete academically in college and university settings. Their performance in the

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present study would indicate that here, too, they were able to compete comparably on a variety of intellectual tasks, i.e., the learning of a paired associate list, and mediated and nonmediation concepts. It is possible that the lower scoring black students try harder at achieving intellectually than lowering IQ scoring white students. An alternate hypothesis might be that vocabulary scores are not good predictors of Full Scale IQ scores for black college students as reported for white college students. Since the vocabulary IQ scores are not predictive of academic performance for black subjects such scores may not be good measures of intellectual functioning (ability) for blacks.

In summation, the findings of the present study indicate that when "soft" was the concept investigated, both the highest and lowest scoring groups profited from the mediation condition; but only the highest scoring group utilized the mediation condition to sufficiently and significantly improve performance over nonmediation. This finding is consistent with previous research on intellectual functioning and mediation for white college students (Jacobson, Millham and Berger, 1969) and black and white first graders (Friendly and Berger, 1976). This clearly suggests that the nature of intellectual functioning is the same for black and white college students as well as for black and white children. That is, black college students

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do not display different and inferior learning strategies, patterns and styles than do their equivalent IQ scoring white counterparts. Specifically, high IQ scoring black first graders and college students were shown to effectively utilize symbolic information processing.

"White" and Black Students

Findings suggest when highest and lowest scoring subjects had prior exposure to a list designed to facilitate the learning of "white" on the subsequent concept list, there was a resistence to producing the response "white." This effect was not apparent for "white" when it had not been mediated on the prior list, i.e., under the nonmediation condition these subjects were able to produce the concept "white" much sooner than they had under the mediation condition.

Minard (1965) suggests when subjects are presented with emotionally arousing stimuli, a failure to recognize the stimuli may occur--that differences in the affective qualities of stimuli affect one's performance. This phenomenon has been labelled "Perceptual Defense" (Johnson, Thompson and Frincke, 1960; McGinnis, 1945; Brown, 1961). McGinnis (1945) succinctly explained perceptual selection or defense as:

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> . . representing conditioned avoidance of verbal symbols having unpleasant meanings to the observer. The stimulus word serves as a cue to a deeply embeded anxiety . . . . Avoidance of further anxiety is contemporaneously aroused in the form of perceptual defense against recognition of the stimulus object . . . .

In light of this hypothesis, it is feasible that the prior experience of black subjects with the concept "white" during the learning of its mediated paired associate list may have acted as a cue or affective threat which produced anxiety and consequent cognitive blocking or perceptual defense. The nature of the black-white relationship in America, past and present, is such that one need not search far for an explanation of black students' possible emotional reactions to the stimulus "white." In addition to the implicit facilitating of "white" on its mediated paired associate list, the list contained the explicit word "black," which may have increased the likelihood of a defensive reaction to the emotion aroused by the concept "white." It would appear, however, that middle scorers are not as defensive around this issue or their defenses do not manifest themselves in this manner.

It should be noted that black students may have been aware, consciously or unconsciously, of the nature of the investigation. School regulations regarding human subject participation demanded that an eligibility list (i.e., in this case, the names of black students only) be

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posted and a general description of the task be included, i.e., "Learning of Word Pairs Study." While the phrase "black college student study" was omitted from the formal description, many of the students were aware that the list contained only the names of black students and deduced that it was a black, intellectual functioning study. Consequently, students who signed up for the experiment may have already been made anxious, and the inclusion of "white" as a mediated concept may have triggered a defensive response.

In a recent study, Swinger (1976) investigated the relationship of militancy, motive to avoid success, and intellectual functioning. Black women were rated on militancy; half of them were then given the instructions that "black women do best" and half of them the instructions "white" women do best" and subsequently administered the Digit Symbol test and the Shipley Hartford Abstraction and Vocabulary tests. Results demonstrated a significant main effect of instructions on vocabulary scores. The black women of that study performed significantly lower when told white women performed the task best. In light of that finding, it is possible that the highest and lowest IQ scoring subjects of the present study may have been demonstrating the "motive to avoid success" on the emotionally arousing concept, "white."

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A common argument against the perceptual defense model has been that the phenomena in question could be described in a more parsimonious fashion; that "Response Biasing"--the frequency of certain words or verbal associations in the subject's social environment--dictates how he will respond to these verbal stimuli (Minard, 1965). For example, mediated generalization theory suggests that when presented with the word pair "BUTTON-BREAD" the implicit response "white" to the explicit word "BREAD" causes the word "white" to present itself in contiguity with the word "BUTTON" in the mind of the subject. Thus, strengthening the "BREAD-white" association and increasing the likelihood that the subject would readily attain the concept "white" in the subsequent list. According to Minard (1965) this assumes that the frequency of the implicit response "white" to the explicit word "BREAD" is the same for all groups of people. Applying this argument to the present study, the equality of the strength of certain word associations for both black and white subjects could be questioned. Are the response hierarchies for a given verbal stimulus similar for the two groups? The hypothesis set forth in this paper predicted that if one equated vocabulary scores of blacks and whites one could consequently assume similar verbal associations, since common and equivalent definitions found in the dictionary would have to be given for maximum scoring. Too, when "soft"

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was the mediated concept, one could predict performance under the mediated condition. These findings of the present study, therefore, are inconclusive in answering the question of a difference in response hierarchies.

Limitations and Implications for Future Research

The present study was founded upon two basic assumptions which results suggest may need additional investigation.

1) Response hierarchies for a given verbal stimulus are the same for black and white students if one equates IQ scores of the two groups. In an attempt to replicate prior investigations as precisely as possible (Jacobson, Millham and Berger, 1969; Millham, Jacobson and Berger, 1971), the present study did not research the response hierarchies of the words employed for black college students. It would be worthwhile to calculate the response dominance of particular words for both black and white subjects and proceed to analyze the similarities and dissimalarities in verbal conotations.

2) Vocabulary IQ scores are excellent predictors of Full Scale IQ scores for black students as they are for white students. Taking into consideration the issue of "cultural"

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IQ test biasing, especially on verbally laden items, it is conceivable to this researcher that a low vocabulary score for a black student does not suggest a low Full Scale IQ score or at least, not low level intellectual functioning.

Another limitation of the present investigation is its inability to access the effects the experimenters sex had on these students. While previous investigations employed male examiners, the present study utilized female examiners. Do students perform better when they are tested by a same sex examiner, by an examiner of the opposite sex, or does sex of the examiner have no significant effect on the performance of subjects under the conditions of studies similar to the present one?

Inspite of the limitations put forth, the present research did indicate that the effects of intellectual functioning and mediation on conceptual learning are the same for black college students as they are for white college students when appropriate stimuli are employed. If the results of this study are generalizable, the utilization of certain concepts (e.g., "white" for black college students) may be inappropriate for a given population due to the stimuli's anxiety arousing effects. The implications of this finding for future studies of this type is far-reaching. It would be paramount that researcher evaluate the social values of intended stimuli prior to

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the collection of data and the evaluation of the results. It is possible that investigators who have not controlled for this phenomenon in conceptual learning studies have not measured a subject's ability to utilize mediators or to conceptualize, but in actuality measured the level of a subject's defensiveness or defensive reactions to social (verbal) stimuli; and just as misinterpretations have been made in the past, they will continue to be made in the future unless researchers are sensitive to the issues involved and consider social values in verbal learning.

In addition, it was demonstrated that lower IQ scoring black students' academic performance was at the same level as the higher scoring groups'. the wake of the present legal and political unrest surrounding the belief that receiving a certain score (high score) on a standardized test indicates that you are "more qualified" for admissions to certain programs (e.g., college, medical, law, or graduate schools), than someone who scored lower, the results of this study call into question the generalizability of that belief to black students which could have a far-reaching implication if replicated.

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APPENDIX

FAMILY BACKGROUND QUESTIONNAIRE

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FAMILY BACKGROUND QUESTIONNAIRE

NAME:_____

GRADE IN SCHOOL:_____

MAJOR:_____

GRADE-POINT-AVERAGE:_____

NUMBER OF CHILDREN IN FAMILY:___

MOTHER'S LAST GRADE COMPLETED: (Check One)

ELEMENTARY SCHOOL (1) (2) (3) (4) (5) (6)

Jr.High (7) (8) (9)

HIGH SCHOOL (10) (11) (12)

COLLEGE (13) (14) (15) (16)

ADVANCED COLLEGE (Graduate School) (17+)

MOTHER'S OCCUPATION: _____

FATHER'S LAST GRADE COMPLETED: (Check One)

ELEMENTARY SCHOOL (1) (2) (3) (4) (5) (6)

Jr.High (7) (8) (9)

HIGH SCHOOL (10) (11) (12)

COLLEGE (13) (14) (15) (16)

ADVANCED COLLEGE (Graduate School) (17+)

FATHER'S OCCUPATION:_____

FAMILY INCOME (strictly confidential)_____

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